WHERE TO USE
Repairing and strengthening structural elements and members in areas where particular types of dynamic stress require the use of free-flowing, high performance grouting mortar with a work-hardening effect.

Some application examples
- Rebuilding and strengthening motorway kerbs.
- Anchoring barriers (acoustic barriers and guardrails).
- Strengthening structural elements and members such as reinforced concrete pillars and beams.
- Rebuilding pier caps and bearing elements on motorway viaducts.
- Integrating floor slabs on bridges and viaducts after removing damaged areas.
- Repairing concrete floors (roads and airports).
- Repairing joints in motorways.
- Repair work on hydraulic structures (breather channels, canals and forced run-off channels).

TECHNICAL CHARACTERISTICS
Mapegrout Betontech HPC is a ready-mixed, fibre-reinforced grouting mortar made from high-strength cement, selected aggregates, special admixtures and structural polymer fibres according to a formula developed in the MAPEI research laboratories.

When Mapegrout Betontech HPC is mixed with water it forms highly fluid grouting mortar suitable for casting into formwork without segregating, including in areas where thick layers need to be installed, without the support of electro-welded mesh.

To allow the product’s expansive properties to develop fully and correctly in the open air, Mapegrout Betontech HPC must be damp-cured.

Mapegrout Betontech HPC may also include 0.25% of Mapecure SRA, a special admixture which has the capacity to improve the dimensional stability of the system. Mapecure SRA guarantees better curing of the mortar by reducing surface tension in the pores and delaying evaporation of the mixing water, thereby enhancing the development of hydration reactions. Mapecure SRA acts as an internal curing agent and, by interacting with some of the main components in the cement, reduces final shrinkage by 20% to 50% compared with the same product without the admixture, thereby reducing the risk of micro-crack formation. Once hardened, Mapegrout Betontech HPC has the following characteristics:
- high compressive strength;
- modulus of elasticity, thermal expansion coefficient and permeability coefficient similar to high quality concrete;
- impermeability to water;
- excellent adhesion to old concrete, if roughened prior to application (surface roughness > 5 mm) and dampened with water, and to rebar, especially when treated with Mapefer or Mapefer 1K.

Mapegrout Betontech HPC complies with the principles defined in EN 1504-9 (“Products and systems for protecting and repairing concrete structures: definitions, requirements, quality control and conformity assessment. General principles for the use and application of systems”), and the minimum requirements of EN 1504-3 (“structural and non-structural repairs”) for R4-class structural mortars.
**RECOMMENDATIONS**

- Do not apply Mapegrout Betontech HPC on smooth concrete. Make sure the surface of concrete is very rough and add rebar where required.
- Do not use Mapegrout Betontech HPC for anchoring elements or members accurately in place (use Mapefill or Mapefill R).
- Do not add cement or admixtures to Mapegrout Betontech HPC.
- Do not add water once the mix has started to set.
- Do not apply Mapegrout Betontech HPC if the temperature is below +5°C.
- Do not use Mapegrout Betontech HPC if the bag is damaged or if it has already been opened.

**APPLICATION PROCEDURE**

**Preparation of the substrate**

- Remove all deteriorated and loose concrete to form a sound, rough and strong substrate. Any areas previously repaired and which are not perfectly bonded must be removed.
- Remove all dust, rust, cement laitance, grease, oil and old paint from the concrete and rebar by sandblasting.
- Saturate the substrate with water.
- Before casting the product, wait until excess surface water has evaporated off. Use compressed air to accelerate this process if required.

**Preparation of the mortar**

Pour approximately 2.9-3.1 litres of water into a cement mixer and slowly add a 25 kg bag of Mapegrout Betontech HPC.

To improve open-air curing, add 0.25% in weight of Mapecure SRA after mixing (0.25 kg every 100 kg of Mapegrout Betontech HPC).

Mix for 1-2 minutes, remove any powder which has stuck to the sides of the mixing drum and mix again for 2-3 minutes to form a fluid, lump-free mix.

A mortar mixer or drill with a mixer fitting may also be used, depending on the amount of mortar to be prepared. Avoid entraining too much air while mixing.

Mapegrout Betontech HPC remains workable for approximately 1 hour at +20°C.

The expansion rate of Mapegrout Betontech HPC has been calibrated to compensate for hygrometric shrinkage.

When integrating areas with layers of Mapegrout Betontech HPC more than 10 cm thick without formwork, use additional contrasting rebar and make sure the thickness of mortar applied complies with Eurocode 2, according to the exposure classes in EN 206/1.

Thinner layers may be applied without adding rebar as long as the surface of the substrate is roughened before application to counteract expansion of the mortar. The expansive action of the mortar takes place during the first few days of hardening.

**Application of the mortar**

Pour Mapegrout Betontech HPC into the formwork from one side only in a continuous flow in order to help expel all the air.

The formwork must not absorb any water from Mapegrout Betontech HPC; we recommend treating the formwork with form-release compound (such as DMA 1000). Make sure all the gaps in the concrete are completely filled. To help the grout flow into difficult areas, use wooden poles or pieces of bar or lightly vibrate the mortar.

**Finishing the mortar**

If the concrete repaired with Mapegrout Betontech HPC needs to have a good surface finish, apply a layer of Mapelastic Guard two-component, light grey cementitious mortar, used to form accurate protective layers on highly stressed structures, and/or Elastocolor Paint elastomeric, acrylic resin-based paint in water dispersion with crack-bridging properties.

Elastocolor Paint complies with the requirements of the technical specifications for the PA cycle of the Italian Highways Authority and is available in a wide range of colours using the ColorMap® automatic colouring system. When dry, both products are waterproof, impermeable to aggressive agents present in the atmosphere but permeable to water vapour and comply with the requirements of EN 1504-2 for coatings (C).

Surfaces repaired with Mapegrout Betontech HPC may also be protected with an epoxy-polyurethane finish comprising Mapecoat E23 two-component, polyamide resin-based primer and Mapecoat PU33 two-component, polyurethane resin-based elastic coating. This cycle meets the requirements of the technical specifications for the PP cycle of the Italian Highways Authority.

**PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION**

- Prepare the mortar using bags of Mapegrout Betontech HPC that have been stored on their original closed pallets.
- In hot weather, store the product in a cool area and use cold water to prepare the mix.
- In cold weather, store the product in a closed area at a temperature of +20°C and protect from frost. Use lukewarm water to prepare the mortar.

- After applying the product, and particularly in hot or windy weather, we recommend curing Mapegrout Betontech HPC carefully to prevent the mixing water evaporating off too quickly, otherwise surface cracks may appear due to plastic shrinkage. Spray water on the surface 6-12 hours after applying the mortar and then repeat this operation every 3-4 hours for at least the first 48 hours and/or protect the surface with mats or plastic sheets.

Alternatively, after tamping the mortar, apply Mapecure E anti-evaporation agent in water emulsion with a low pressure pump, Mapecure S film-forming curing agent for mortar and concrete or Elastocolor Primer, a high-penetration solvent fixing agent for absorbent surfaces and curing agent for repair mortar.

As with all the best products available on the market in this category, Mapecure E...
**PRODUCT IDENTIFICATION**

- **Strength class according to EN 1504-3:** R4
- **Type:** CC
- **Consistency:** powder
- **Colour:** grey
- **Maximum size of aggregate (prEN 12620) (mm):** 6
- **Bulk density (kg/m³):** 1,400
- **Dry solids content (%):** 100
- **Ion chloride content - minimum requirement ≤ 0.05% according to EN 1015-17 (%):** ≤ 0.05

**APPLICATION DATA (at +20°C - 50% R.H.)**

- **Colour of mix:** grey
- **Mixing ratio:** 100 parts of Mapegrout Betontech HPC with 11.5-12.5 parts of water (approx. 2.9-3.1 l of water per 25 kg bag) and 0.25% of Mapecure SRA (one 0.25 kg canister every 4 bags of Mapegrout Betontech HPC)
- **Consistency of mix:** fluid
- **Slump flow according to UNI 11041 (mm):** 680
- **Density of mix (kg/m³):** 2,300
- **pH of mix:** > 12.5
- **Application temperature:** +5°C to +35°C
- **Pot life of mix:** approx. 1 hour

**FINAL PERFORMANCE (12% mixing water + 0.25% Mapecure SRA)**

<table>
<thead>
<tr>
<th>Performance characteristic</th>
<th>Test method</th>
<th>Requirements according to EN 1504-3 for R4 class mortar</th>
<th>Performance of product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive strength (MPa):</td>
<td>EN 12390/3</td>
<td>≥ 45 (after 28 days)</td>
<td>&gt; 20 (after 1 day)</td>
</tr>
<tr>
<td>Compressive modulus of elasticity (GPa):</td>
<td>EN 13412</td>
<td>≥ 20 (after 28 days)</td>
<td>30 ± 2 (after 28 days)</td>
</tr>
<tr>
<td>Adhesion to concrete (substrate in MC 0.40 type concrete) according to EN 1766 (MPa):</td>
<td>EN 1542</td>
<td>≥ 2 (after 28 days)</td>
<td>&gt; 2 (after 28 days)</td>
</tr>
<tr>
<td>Impeded expansion in open air (µm/m):</td>
<td>not required</td>
<td>&gt; 400 after 1 day</td>
<td></td>
</tr>
<tr>
<td>Warp test:</td>
<td>/</td>
<td>not required</td>
<td>convex</td>
</tr>
<tr>
<td>Resistance to cracking:</td>
<td>“O Ring Test”</td>
<td>not required</td>
<td>no cracks after 180 days</td>
</tr>
<tr>
<td>Resistance to accelerated carbonation:</td>
<td>EN 13295</td>
<td>Depth of carbonation ≤ than the reference concrete (MC 0.45 type water/cement ratio = 0.45) according to UNI 1766</td>
<td>meets specifications</td>
</tr>
<tr>
<td>Impermeability to water under pressure – penetration depth - (mm):</td>
<td>EN 12390/8</td>
<td>not required</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Capillary absorption (kg/m²·h⁰.⁵):</td>
<td>EN 13057</td>
<td>≤ 0.5</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Slip-resistance of rebar – bond strength (MPa):</td>
<td>RILEM-CEB-FIP RC6-78</td>
<td>not required</td>
<td>&gt; 25</td>
</tr>
<tr>
<td>Thermal compatibility measured as adhesion according to EN 1542 (MPa):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– freeze-thaw cycles with de-icing salts:</td>
<td>EN 13687/1</td>
<td>≥ 2 (after 50 cycles)</td>
<td>&gt; 2</td>
</tr>
<tr>
<td>– storm cycles:</td>
<td>EN 13687/2</td>
<td>≥ 2 (after 30 cycles)</td>
<td>&gt; 2</td>
</tr>
<tr>
<td>– dry heat cycles:</td>
<td>EN 13687/4</td>
<td>≥ 2 (after 50 cycles)</td>
<td>&gt; 2</td>
</tr>
<tr>
<td>Exposure class:</td>
<td>EN 206/1</td>
<td>not required</td>
<td></td>
</tr>
<tr>
<td>Initial crack resistance f₀ (MPa):</td>
<td>UNI 11039/2</td>
<td>not required</td>
<td>6.6</td>
</tr>
<tr>
<td>Ductility index:</td>
<td>UNI 11039/2</td>
<td>not required</td>
<td>0.92</td>
</tr>
<tr>
<td>Limit of proportionality (LOP) (MPa):</td>
<td>EN 14651</td>
<td>not required</td>
<td>f₁₁₁ 7.2</td>
</tr>
<tr>
<td>Residual flexural strength (MPa):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMOD 1 = 500 µm</td>
<td>EN 14661</td>
<td>not required</td>
<td>f₁₀₁ 6.8</td>
</tr>
<tr>
<td>CMOD 2 = 1,500 µm</td>
<td></td>
<td></td>
<td>f₁₀₂ 8.8</td>
</tr>
<tr>
<td>CMOD 3 = 2,500 µm</td>
<td></td>
<td></td>
<td>f₁₀₃ 8.4</td>
</tr>
<tr>
<td>CMOD 4 = 3,500 µm</td>
<td></td>
<td></td>
<td>f₁₀₄ 7.4</td>
</tr>
<tr>
<td>Toughness characteristics - load at first cracking:</td>
<td>ASTM C1018</td>
<td>not required</td>
<td>&gt; 20 kN</td>
</tr>
<tr>
<td>– toughness index:</td>
<td></td>
<td></td>
<td>f₀ &gt; 20</td>
</tr>
<tr>
<td>Reaction to fire:</td>
<td>EN 13501/1</td>
<td>Euroclass</td>
<td>E</td>
</tr>
</tbody>
</table>
and Mapecure® impede the bond with successive layers. Therefore, if a smoothing layer or paint is to be applied after curing, they must be completely removed by sandblasting.

If Elastocolor Primer® is used to prevent evaporation, on the other hand, the final protective layer of Elastocolor Paint or Elastocolor Rasante® may be applied directly on the surface without removing it.

Cleaning
Wash mortar from tools with water before it hardens. Once hardened, cleaning is much more difficult and it must be removed mechanically.

CONSUMPTION
Approximately 20.5 kg/m² per cm of thickness.

PACKAGING
Mapegrout Betontech HPC® is supplied in 25 kg bags.

STORAGE
Mapegrout Betontech HPC® may be stored for 12 months in its original packaging. The special 25 kg vacuum-packed polyethylene bags may be stored outside for the entire duration of the site. Rain has no effect on its characteristics.

This product conforms to the prescriptions of Reg. (EC) N. 1907/2006 (REACH) - Annex XVII, item 47.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION
Mapegrout Betontech HPC® contains cement that when in contact with sweat and other body fluids causes irritant alkaline reactions and allergic reactions to those predisposed. It can cause damage to eyes. It is recommended to use protective gloves and goggles and to take the usual precautions for handling chemicals. If the product comes in contact with the eyes or skin, wash immediately with plenty of water and seek medical attention. For further and complete information about the safe use of our product please refer to the latest version of our Material Safety Data Sheet.

PRODUCT FOR PROFESSIONAL USE.

WARNING
Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

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All relevant references for the product are available upon request and from www.mapei.com